

CLAIMS

I claim:

1. In a tool having a pair of elongate housings adapted to be joined together in a housing assembly for enclosing and supporting a flexible drive mechanism entrained about a pair of rotatable elements, each being disposed within the housing assembly at opposite ends thereof, a flexible drive mechanism providing
5 a transfer of power between the rotatable elements so that rotation of one rotatable element at an input end of the housing assembly will effect driven rotation of the rotatable element at an output end of the housing assembly, the improvement wherein:

the elongate housings include male and female configurations for aligning and
10 joining the elongate housings without independent fasteners.

2. The improvement of claim 1, wherein the male and female configurations take the form of male bosses provided on one of the elongate housings and mating female tapered holes in the other of the elongate housings, the male bosses being swaged outwardly into engagement with walls of the tapered holes.

3. The improvement of claim 1, wherein the male and female configurations take the form of mating snap fit structure included in each of the elongate housings.

4. The improvement of claim 1, wherein the elongate housings further include a pair of internal configurations, each supporting one of the rotatable elements, the length between the internal configurations defining a precision distance for controlling the working length of the flexible drive mechanism.

5. The improvement of claim 4, wherein the flexible drive mechanism is pre-stretched to eliminate the need for any separate tensioning device in the tool.

6. The improvement of claim 5, wherein the elongate housings further include aligned attachment holes formed therein between the input end and the output end of the housing assembly for facilitating attachment to other tools.

7. The improvement of claim 6, wherein the elongate housings are formed in an angular configuration having a higher stress area in which the flexible drive mechanism is supported by a track section located closer to a centerline of the tool.

8. The improvement of claim 6, wherein the elongate housing takes the form of a tapered configuration tapering from the input end to a smaller dimension at the output end, the rotatable element at the output end being reduced in size relative to the rotatable element at the input end and being provided with a male drive member extending from one side of the housing assembly.

9. The improvement of claim 8, wherein the rotatable element at the output end is formed with an internal configuration located in an end opposite the male drive member for accepting tools with corresponding male configuration.

10. The improvement of claim 1, wherein the rotatable element at the output end includes an internal configuration formed with a throughbore for enabling direct attachment to other objects to be moved.

11. The improvement of claim 1, wherein at least one end of the elongate housings is provided with an adjustable angle interlock configuration providing a means for joining two or more tools with similar design to provide output rotation along a common axis, the interlock configurations joining the tools overlying and encircling aligned rotatable elements having an external or internal configuration for receiving a retaining member for securing the rotatable elements of the tools.

12. The improvement of claim 1, wherein the elongate housings further include an internal configuration located near the input end for retaining and supporting a manually operated switch button and a switch plate operably connected to the switch button, the switch button having a flexible member for moving the
5 switch plate and providing ratcheting action, the switch plate having an external configuration for providing one way ratcheting action when engaged with the flexible drive mechanism or one of the rotatable elements, the switch plate also having an internal configuration for engaging and retaining the flexible member of the switch button at a desired setting.

13. The improvement of claim 1, wherein the elongate housings are fabricated from a friction reducing material.

14. The improvement of claim 1, wherein the rotatable elements are fabricated from a friction reducing material.

15. The improvement of claim 1, wherein the elongate housings and rotatable elements include a wear reducing coating for extending tool life.

16. The improvement of claim 1 wherein the elongate housings provide structure for enclosing and supporting one of the rotatable elements with a secondary rotary power transfer configuration and a final drive rotatable element, the rotatable element along with the secondary rotary power transfer configuration accepting and
5 transferring rotational power to the final drive rotatable element which, in turn, accepts and transfers rotational force to an object tool at a secondary angle from the elongate housings.

17. The improvement of claim 16, wherein one of the elongate housings includes an end plate having an interlocked configuration providing for angle adjustment and combining of similarly designed tools, and the final drive rotatable element is engageable with a retaining member for securing rotatable components on
5 other tools.

18. The improvement of claim 1, wherein one of the elongate housings includes a power producing mechanism for driving the flexible drive mechanism, and a power switch for controlling the power producing mechanism.

19. The improvement of claim 1, wherein one of the elongate housings includes a structure for providing mechanical advantage to one of the rotatable elements or the flexible drive mechanism, the structure including a manually operated device for producing increased torque thereon by a control switch for
5 controlling direction of torque to one of the rotatable element or the flexible drive mechanism.

20. The improvement of claim 19, wherein the elongate housing includes a gauge operably connected with the mechanical advantage structure for measuring torque.

21. The improvement of claim 1, wherein the elongate housings are formed to attach directly to other tools having drive elements by conventional attachment structure, the rotatable elements being configured to attach directly to the drive elements of the other tools.

22. The improvement of claim 1, wherein the rotatable element on the input end is constructed and arranged to engage a drive of a machine tool, and the rotatable element on the output end is constructed and arranged to receive a

conventional tool holding system.

23. The improvement of claim 1, wherein the elongate housings include a light source and a manually operable light switch mechanism operably connected thereto, the light switch mechanism being externally accessible to control the light source.

24. The improvement of claim 1, wherein the elongate housings, the flexible drive mechanism and the rotatable elements are formed from high strength non-sparking, non-conductive and non-magnetic alloys and composite materials.

25. The improvement of claim 1, wherein the elongate housings, the flexible drive mechanism and the rotatable elements are produced by die casting or injection molding.

26. A method of joining at least two tools having housings and rotatable elements together at adjustable angles, the method comprising the steps of:

- a) providing each tool housing with a respective mating interlock configuration in the vicinity of one of the rotatable elements so that the tool can be
5 interlocked together with the rotatable elements aligned;
- b) passing a torque transmitting element through the aligned rotatable elements; and
- c) providing a retaining element engageable with the torque transmitting element to secure the interlocked tools together.

27. An improved switch for controlling the internal drive mechanism of a tool comprising:

a two-part switch mechanism configured of a switch plate and a switch button connected to the switch plate for controlling the internal drive mechanism, the

- 5 switch button having a flexible member for enabling movement of the switch plate and providing ratcheting action of the internal drive mechanism, the switch plate having an external configuration engageable with the internal drive mechanism for providing one way ratcheting action, and an internal configuration engageable with the switch button for retaining same.

28. An angle tool comprising:

- an outer housing enclosing a plurality of gear-like drive members and including a plurality of end plates, the drive members having configurations for accepting and transferring rotary power, and the end plates having external
5 configurations to enable securement to the outer housing and internal configuration for securing the drive members.

29. The tool of claim 28, wherein the end plates include interlock configurations for combining with, and angle adjusting of, other similarly designed tools, the gear-like drive members further having a configuration for receiving a retaining member to secure the tools together.

30. A combination tool comprising:

- a tube having an input end, an output end and a handle portion, the tube being formed with a first configuration in the handle portion to receive a cross member substantially perpendicularly thereto, the tube also having an internal cavity for
5 storing the cross member therein, the tube further having a second configuration at the input end for accepting an object to be moved and a third configuration at an output end for accepting existing tools, the cross member having an enlarged surface area to define a surface adapted to be stricken with a drive tool and a configuration on the opposite end to directly accept object tools.

31. The improvement of claim 30, wherein the output end of the tube

includes an internal configuration for accepting a standardized male portion of various drive members, the various drive members being utilized to transfer a driving force to variously shaped objects requiring movement.

32. A quick changeable, tool holding system for a manual tool comprising:
various tool holding elements, manually insertable in a tool, with configurations for accepting and transferring rotational force, the tool holding elements having internal configurations for accepting various object tools and
5 further allow for adjustment of a working length of the object tool, the tool holding elements further having a retaining configuration and a fastening device engageable with the retaining configuration to secure the object tool in the tool holding element.

33. In a flexible drive tool having a housing assembly of a particular thickness with a pair of rotatable elements at opposite ends entrained by a flexible drive mechanism, the improvement wherein:

- at least one of the rotatable elements being internally engageable with a drive
5 member having an exposed portion extending beyond the thickness of the housing assembly to define a low profile tool.

34. A multiple use tool comprising:

a one-piece tool having a low-profile external configuration which is manually engageable and further offers internal and external configurations for engagement with object tools having a matching internal configuration.

35. An adjustable length fastening system for joining at least two tools together, the system comprising:

- torque transmitting structure on each of the two tools alignable with each other for accepting a manually operable retainer member to join the tools together,
5 the retainer member having an adjustable working length to permit adjusting angles

of the joined tools without complete disassembly of the joined tools.

36. In adjustable length extension tools, the improvement wherein:

the adjustable-length extension tools have a torque-transmitting shape that is consistent throughout its length allowing adjustable length operation with tools equipped with mating throughbore configurations and the torque-transmitting shape

5 further directly accepts object tools.